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ORIGINAL ARTICLE

The effect of *Aloe vera* gel and sweet almond oil on striae gravidarum in nulliparous women

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ABSTRACT

Background and objective: Striae are linear depressions of the skin and causes psychological and sexual problems in person. Different methods are used to prevent and treat them but there is no definitive method. We compared the effect of *Aloe vera* gel and sweet almond oil on striae gravidarum.

Materials and methods: In this double-blind clinical trial, 160 nulliparous women were enrolled and randomly divided into three case groups and one control group. The four groups were given 700 g *Aloe vera*, sweet almond oil, and base cream to use topically on the abdominal skin and forth group don't receive any medication as control group in five steps, they were examined study's variables (itching, erythema, and spread of striae) using statistical tests in SPSS.

Result: The findings showed that *Aloe vera* and sweet almond oil creams are more effective than the base cream and the control group to decrease itching and erythema and to prevent the spread of striae on the surface of abdomen ($p < .05$); however, all three creams had a similar effect on the diameter and the number of striae ($p > .05$).

Conclusions: *Aloe vera* and sweet almond oil creams reduce the itching of striae and prevent their progression.

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KEYWORDS
Striae; *Aloe vera*; sweet almond oil

Introduction

Striae are depressed lines on the skin that are associated with epidermal atrophy, have different lengths, and their width can vary from 1 to 10 mm [1]. They are first pink or purple, but then become white, semi-transparent, and atrophy [2]. If they appear during pregnancy, they are called pregnancy striae or striae gravidarum. Pregnancy striae refer to the physiological changes of the skin during pregnancy that appear as purple-violet lines during the sixth and seventh months of the pregnancy and after a while are changed into the narrow wrinkled lines and become hypo pigmented. They are mostly created on the abdominal skin, but sometimes on the breasts, thighs and armpits and are considered as one of the most common problems of pregnancy. Although the main etiology of pregnancy striae has remained unknown, such risk factors as genetic factors, family history, skin type, skin color, the young age of the mother, gestational age, high weight gain during the pregnancy (more than 15.5 kg), malnutrition, gestational diabetes, and the reduction of skin collagen effect its incidence [3–6].

Although striae become pale and faded away within a few months to 2 years after the pregnancy, they never disappear completely [7]. They are observed in 90% of pregnancies, causes harm to the mother's beauty and sometimes lead to the psychological and sexual problems, as well as diffidence in the mother. In some cases, the place of striae is wounded by scratching [3,8,9]. A variety of treatments including topical retinoid, laser therapy, and chemical peels have been so far examined [10]. According to many studies using plant oils such as olive oil, almond oil, and cocoa butter can effectively improve the markings of striae [3].

Evidences are available from 1000 years ago in the treatment of striae gravidarum; ancient Egyptians would have used various medications such as condor tree resin for the treatment of pregnancy striae [11]. In Iranian, Chinese, and Greek traditional medicine almond oil has been also used to treat skin dryness, psoriasis, eczema,

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and pregnancy striae [12]. Moreover, ancient Iranians had used aloe Vera to soften skin and prevent striae. Several studies have shown that aloe Vera gel accelerates the process of wound healing in both internal and external wounds [13,14]. In a study conducted in 2006 by Salter et al., they indicated that striae is associated with such tissue changes as atrophy and the loss of skin slots that are similar to scar formation [8].

In a study that Ta'avoni et al. conducted in 2010 on one hundred 20–30 years old nulliparous women with the body mass index of 18.5–25 and the gestational age of 18–20 weeks to investigate the effect of olive oil on the prevention and progress of pregnancy striae, it was indicated that olive oil has no effect on reducing the incidence and severity of pregnancy striae [3]. In another study, conducted in 2012 again by Ta'avoni et al. on 105 nulliparous women with the gestational age of 18–20 weeks to assess the effect of olive oil and teak cream on pregnancy striae in the second trimester of pregnancy, it was concluded that using teak cream until the end of the second trimester can effectively reduce the incidence of pregnancy striae [15].

Unfortunately, when pregnancy striae occur, it will remain permanently and if become hypo pigmented (change to skin color), the only current treatment available is laser that will cost a lot. Given the high cost of laser and 50–90% prevalence of pregnancy striae [8,16], finding a way to prevent the incidence and progress of striae seems necessary. It seems that through using some useful methods striae incidence can be prevented; moreover, when they are still immature (i.e. when they are purple), their progress and extension can be prevented. Given the properties of *Aloe vera* and sweet almond oil, it seems that these substances can have impact on striae incidence and prevent their extension. Since we aimed at evaluating the efficacy of a herbal medicine on this purpose.

Materials and methods

This is a double-blind clinical trial study. The subjects and the examiner were aware of the type of prescribed medication. The study's population consisted of all nulliparous women referred to Share-kord Imam Ali gynecological clinic, and the study's sample consisted of 160 women who were randomly divided into four groups of 40 subjects: including one control and three case groups. The study received ethics approval from the Ethics Committee of shahrekord University of Medical Sciences (12590), and IRCT: 2016110827998N4. All Lore race (dominant race in Shahrekord city) participants gave written informed consent for entrance one of four groups randomly.

Inclusion criteria: 20–35-years old nulliparous women with normal body mass index (18.5–25), gestational age 16–18 weeks, informed consent for participation in the study; use no topical medication for the treatment or prevention of striae before entering the study.

Exclusion criteria: twin pregnancy; polyhydramnios; preterm labor; the subject's unwillingness to participate in the study; early termination of the cream; below 2 kg or above 4 kg infant birth weight; having skin diseases or striae previously and using creams other than one prescribed for the study.

A total number of 160 women by Simple type of non-probability sampling method were enrolled and 149 patients remained according to the study's exclusion criteria. The first group (Group A, $n = 39$) was given base cream containing aloe Vera gel, and the second group, (group B, $n = 39$) was given base cream containing sweet almond oil and third group (group C, $n = 37$) was given just base cream to rub it gently and without massage on their abdomen twice a day; the fourth group (group D, $N = 34$) was used as the control group and didn't use any medication (Figure 1). Data were collected using a standard questionnaire by the practitioner during a 5 months period and in monthly referral of the subjects to the clinic (in five steps). The first exam (step 0) was done before using the cream and the next five steps were done in monthly intervals. Because of the weight effect on Stria, the patients weight was measured in five steps.

Aleo vera gel and Almond oil are easy soluble in Orand base cream and an appropriate antioxidant were added for prevention of chemical and microbial degeneration. Orand base cream contains alcholasetyl, glycerin, trietanolamin, monoestearic acid, white vaseline, and distilled water.

Drug synthesis including appropriate mixture and on time release of drug from base were done by pharmacist consultant in research center of Medicinal Plants of Shahrekord medical university.

Each person of the first group of the study's population (A) was given 700 g combination of *Aloe vera* (extracted from aloe Vera leaves) in a cream base and in a 1 to 1 ratio to rub 2 g every 12 h gently and without massage on the abdominal skin from the 16th week of pregnancy until the delivery day. The amount of cream was calculated based on the Finger Tip Unit (FTU) (26). Similarly, in the second group of the study's population (B), each subject was given 700 g combination of sweet almond oil in a cream base to rub 2 g every 12 h gently and without massage on all abdominal area from the 16th week of pregnancy until the delivery day. The subjects of the third group (C) were given 700 g only base cream

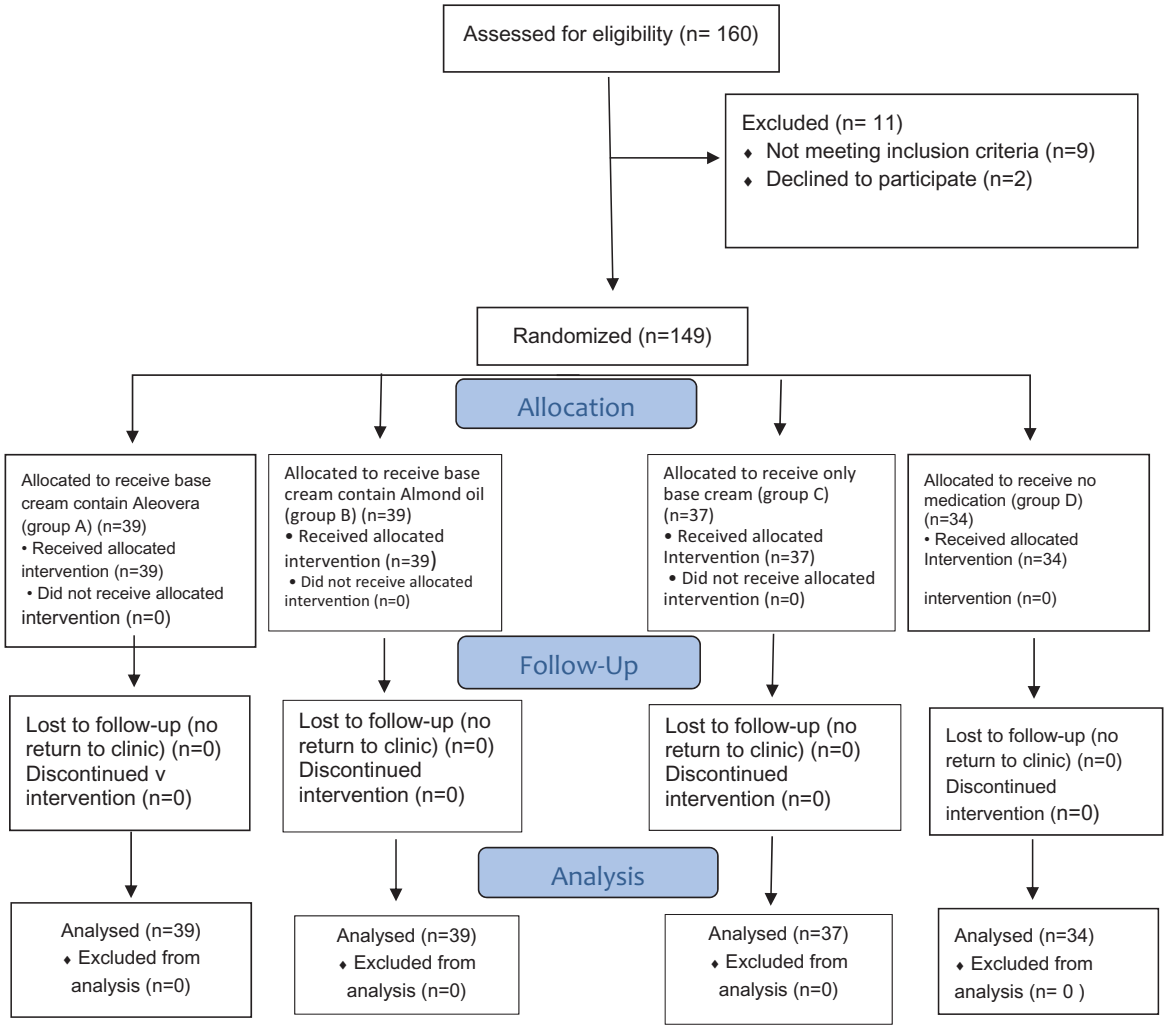

Figure 1. Study flowchart.

to rub 2 g every 12 h gently and without massage on all abdominal area from the 16th week of pregnancy until the delivery day. The fourth group (D), as the control group, did not receive any medication to treat or prevent striae.

Striae diameter was measured by Calipers, erythema by the observer's observation (qualitative measure: low, medium, high), itching based on the subject's expression (qualitative measure: low, medium, high), the number of abdominal areas affected by striae was measured by the examiner based on counting the number of areas (abdomen division into four zones), and the number of striae was measured based on the observer's observations. Moreover, in each visit, every subject's the amount of consumption therapeutic cream was examined by examiner.

The collected data were entered into the SPSS software version 17 and were analyzed using descriptive statistics such as Chi- Square, ANOVA, Kruskal–Wallis test. Following Kruskal–Wallis test, DUNN test was used to compare the groups in pairs.

Results

The age of the women was between 20 and 35 with a mean of 23.9 ± 3.8 (years) and analysis of the variance showed no significant difference between the ages of the subjects in all groups ($p > .05$). Based on the information in Table 1, there is no significant difference in height, weight, and body mass index. Patient weight was measured in five steps of treatment and no significant difference was seen between four groups. ($p > .05$) (Data are not shown in the table).

Also, numbers and diameter of striae, itching and erythema at first exam (stage 0) showed no significant difference in all groups. After five steps of examination, the extension of striae in all four abdominal zones was 2 (8%) in *Aloe vera* cream group, 2 (9.5%) in sweet almond oil group, 5 (18.5%) in base cream group, and 19 (65.5%) in the control group. Hence, it can be concluded that *Aloe vera* and sweet almond oil creams can prevent the development and extension of striae on the abdomen. (Data are not shown in the table).

Table 1. Comparison of demographic variable between groups before the intervention.

Variables Groups	*Aleo vera* (A) Mean ± SD	Almond oil (B) Mean ± SD	Base cram (C) Mean ± SD	Control (D) Mean ± SD	*p Value
Height (CM)	163.9 ± 6	162.5 ± 6.4	161.1 ± 5.2	164.1 ± 5.2	.298
Weight (KG)	63.7 ± 9.8	61.2 ± 8.7	58.7 ± 6.5	62.8 ± 8.6	.062
BMI	23.7 ± 3	23.1 ± 2.6	22.4 ± 1.7	23.2 ± 2.2	.138
Striae diameter	1.2 ± 0.56	0.86 ± 0.31	1 ± 0.42	0.75 ± 0.42	.270
Striae number	2.9 ± 1.3	1.6 ± 0.56	3.4 ± 1.9	1.3 ± 1.7	.157
Erythema: (*n*, %)					
Without	30 (76.9)	34 (87.2)	25 (65.8)	24 (72.2)	.254
Low	1 (2.6)	0 (0)	5 (13.2)	6 (18.2)	
Moderate	7 (17.9)	5 (12.8)	8 (21.1)	3 (9.1)	
High	1 (2.6)	0 (0)	0 (0)	0 (0)	
Itching: (*n*, %)					
Without	32 (82.1)	36 (92.3)	27 (71.1)	27 (81.8)	.157
Low	2 (5.1)	0 (0)	3 (7.9)	0 (0)	
Moderate	3 (7.7)	2 (5.1)	7 (18.4)	6 (18.2)	
High	2 (5.1)	1 (2.6)	1 (2.6)	0 (0)	

*p Values refer to Chi-square and Anova test.

Table 2. Comparison of diameter and number of striae in groups after intervention (in five steps).

		Group				
Variables	Step	*Aloe vera* (A) Mean ± SD	Almond oil (B) Mean ± SD	Base cream (C) Mean ± SD	Control (D) Mean ± SD	*p Value
Diameter	1	1.15^{a} ± 0.56	0.91^{b} ± 0.76	0.97 ± 0.76	$1^{a,b}$ ± 1.2	.004
	2	1.15^{a} ± 0.82	0.91^{b} ± 0.54	0.97 ± 1.03	$0.95^{a,b}$ ± 1.7	<.001
	3	1.07^{a} ± 1.05	0.96^{b} ± 0.85	1^{c} ± 1.5	$0.95^{a,b,c}$ ± 2.2	<.001
	4	1.95^{a} ± 1.03	0.94^{b} ± 0.9	1^{c} ± 1.4	$1^{a,b,c}$ ± 2.4	<.001
	5	1.91^{a} ± 0.95	0.94^{b} ± 0.9	1^{c} ± 1.3	$1^{a,b,c}$ ± 2.4	<.001
Striae number	1	5.1^{a} ± 2.3	3.9^{b} ± 1.9	3.8 ± 2.8	$5.5^{a,b}$ ± 5.9	.001
	2	6.1^{a} ± 3.8	5.4^{b} ± 2.8	5.2^{c} ± 4.9	$6.9^{a,b,c}$ ± 9.8	<.001
	3	5.7^{a} ± 4.7	5.6^{b} ± 4.2	6^{c} ± 7.4	$7.6^{a,b,c}$ ± 14.6	<.001
	4	5.6^{a} ± 5	6^{b} ± 4.7	7.2^{c} ± 8.4	$9^{a,b,c}$ ± 18.7	<.001
	5	5.81^{a} ± 5	6.3^{b} ± 5.2	8^{c} ± 9.6	$10.1^{a,b,c}$ ± 22.4	<.001

*p Values refer to Kruskal–Wallis test.
(According to Dunn's *post hoc* test, groups with the same letters ($^{a,\ b}$ and $^{c)}$ are significantly different from each other).

According to Table 2, after five follow up steps, a significant difference was observed between striae diameter in groups A and B with the group D in all five steps; this means that striae diameter has reduced in groups A and B, and in step 3, 4 and 5, this diameter reduction was observed also between groups C and D. Likewise, in terms of reducing the number of striae, at all the steps a significant difference was observed between groups A and B with group D, this difference was also observed between groups C and D in steps 2, 3, 4, and 5, that concludes all the three groups of A, B and C have been almost similar in terms of reducing the number of striae.

The data in Table 3 show that the difference of reduction in erythema and redness, in the groups A and B at all steps and in the group C in steps 3 and 4 were significant comparing the group D. But groups A and B have been more effective in reducing erythema and redness of the striae. Group C also has been effective in reducing erythema; however, groups A and B have had a greater impact.

According to the significant levels of Table 4 in terms of itching reduction, at all the steps a significant difference was observed between groups A and B with group D, this difference was also observed between groups C and D in steps 2, 3, and 4, between groups B and C in steps 4 and 5, and between groups A and C at step 5. Thus, it can be concluded that the creams used by groups A and B have been more effective in reducing itching.

Discussion

Topical application of *Aloe vera* and almond oil has been traditionally recommended and no side effects either on mother or fetus has been reported by the studies conducted so far [14,17,18].

According to the statistical analysis and the data obtained from this trial, it can be concluded that the base creams containing *Aloe vera* gel and sweet almond oil have been more effective than the base cream only and the control group in reducing erythema and itching of the striae. However, in decreasing the diameter and number of the striae all three used creams had a similar impact and have a significant difference with the control group. Although the means obtained for reduction in diameter and number of the striae has been different between *Aloe vera* and

Table 3. Comparison of erythema of striae in four groups after intervention (in five steps).

		Group				
Step	Condition	*Aloe vera* (A) *N* (%)	Almond oil (B) *N* (%)	Base cream (C) *N* (%)	Control (D) *N* (%)	*p Value
1	Without erythema	31 (79.5)[a]	29 (74.4)[b]	21 (55.3)	12 (36.4)[a,b]	<.001
	Low	4 (10.3)[a]	7 (17.9)[b]	15 (39.5)	10 (30.3)[a,b]	
	Moderate	4 (10.3)[a]	3 (7.7)[b]	2 (5.3)	7 (21.2)[a,b]	
	High	0 (0)[a]	0 (0)[b]	0 (0)	4 (12.1)[a,b]	
2	Without erythema	25 (64.1)[a]	28 (71.8)[b]	17 (44.7)[c]	7 (21.2)[a,b,c]	<.001
	Low	9 (23.1)[a]	9 (23.1)[b]	19 (50)[c]	14 (42.4)[a,b,c]	
	Moderate	4 (10.3)[a]	1 (2.6)[b]	2 (5.3)[c]	12 (36.4)[a,b,c]	
	High	1 (2.6)[a]	1 (2.6)[b]	0 (0)[c]	0 (0)[a,b,c]	
3	Without erythema	20 (51.3)[a]	20 (51.3)[b]	11 (28.9[c])	4 (12.1)[a,b,c]	<.001
	Low	14 (35.9)[a]	19 (48.7)[b]	27 (71.1[c])	20 (60)[a,b,c]	
	Moderate	5 (12.8)[a]	0 (0)[b]	0 (0)[c]	7 (21.2)[a,b,c]	
	High	0 (0)[a]	0 (0)[b]	0 (0)[c]	2 (6.1)[a,b,c]	
4	Without erythema	16 (41)[a]	21 (53.8)[b]	11 (28.9)	4 (12.1)[a,b]	<.001
	Low	22 (56.4)[a]	18 (46.2)[b]	27 (71.2)	20 (60)[a,b]	
	Moderate	1 (2.6)[a]	0 (0)[b]	0 (0)	7 (21.2)[a,b]	
	High	0 (0)[a]	0 (0)[b]	0 (0)	2 (6.1)[a,b]	
5	Without erythema	17 (43.6)[a]	22 (56.4)[b]	11 (28.9)	4 (12.1)[a,b]	<.001
	Low	22 (56.4)[a]	17 (43.6)[b]	27 (71.1)	22 (66.7)[a,b]	
	Moderate	0 (0)[a]	0 (0)[b]	0 (0)	7 (21.2)[a,b]	
	High	0 (0)[a]	0 (0)[b]	0 (0)	7 (21.2)[a,b]	

*p Values refer to Chi-square test.
(According to Dunn's *post hoc* test, groups with the same letters ([a, b] and [c]) are significantly different from each other).

Table 4. Comparison of itching of striae in four groups after intervention (in five steps).

		Group				
Step	Condition	Aloe vera (A) *N* (%)	Almond oil (B) *N* (%)	Base cream (C) *N* (%)	Control (D) *N* (%)	*p Value
1	Without itching	35 (89.7)[a]	33 (84.6)[b]	24 (63.2)	17 (51.5)[a,b]	<.001
	Low	2 (5.1)[a]	2 (5.1)[b]	13 (34.2)	2 (6.1)[a,b]	
	Moderate	2 (5.1)[a]	3 (7.7)[b]	1 (2.6)	12 (36.4)[a,b]	
	High	0 (0)[a]	1 (2.6)[b]	0 (0)	2 (6.1)[a,b]	
2	Without itching	33 (84.6)[a]	34 (87.2)[b]	25 (65.8)[c]	11 (33.3)[a,b,c]	<.001
	Low	4 (10.3)[a]	3 (7.7)[b]	11 (28. 9)[c]	7 (21.2)[a,b,c]	
	Moderate	1 (2.6)[a]	2 (5.1)[b]	2 (5.3)[c]	11 (33.3)[a,b,c]	
	High	1 (2.6)[a]	0 (0)[b]	0 (0)[c]	4 (12.1)[a,b,c]	
3	Without itching	30 (76.9)[a]	35 (89.7)[b]	23 (60.5)[c]	5 (15.2)[a,b,c]	<.001
	Low	7 (17.8)[a]	4 (10.3)[b]	12 (31.6)[c]	9 (27.3)[a,b,c]	
	Moderate	2 (5.1)[a]	0 (0)[b]	3 (7.9)[c]	11 (33.3)[a,b,c]	
	High	0 (0)[a]	0 (0)[b]	0 (0)[c]	8 (24.2)[a,b,c]	
4	Without itching	33 (84.6)[a]	38 (97.4)[b]	23 (60.5)[b,c]	4 (12.1)[a,b,c]	<.001
	Low	6 (15.4)[a]	1 (2.6)[b]	13 (34.2)[b,c]	8 (24.2)[a,b,c]	
	Moderate	0 (0)[a]	0 (0)[b]	0 (0)[b,c]	13 (3.4)[a,b,c]	
	High	0 (0)[a]	0 (0)[b]	2 (5.3)[b,c]	8 (24.2)[a,b,c]	
5	Without itching	39 (100)[a]	39 (100)[b]	22 (57.9)[a,b]	4 (12.1)[a,b]	<.001
	Low	0 (0)[a]	0 (0)[b]	13 (34.2)[a,b]	9 (27.3)[a,b]	
	Moderate	0 (0)[a]	0 (0)[b]	2 (5.3)[a,b]	12 (36.4)[a,b]	
	High	0 (0)[a]	0 (0)[b]	1 (2.6)[a,b]	8 (24.2)[a,b]	

*p Values refer to Chi-square test.
(According to Dunn's *post hoc* test, groups with the same letters ([a, b] and [c]) are significantly different from each other).

almond oil groups with the base cream group, this difference is not statistically significant.

In a study conducted by Behnia et al. in 2000 on 159 nulliparous women, they showed that sweet almond oil and glycerin have a positive impact on reducing the severity of pregnancy striae [16]. Furthermore, regarding the reduction in abdominal striae development in aloe Vera and sweet almond oil groups, it is concluded that the creams containing aloe Vera gel and sweet almond oil prevent the development of abdominal striae.

In a study conducted by Ta'avoni et al. in 2012 [15] on 100 20–30-years old nulliparous women with the body mass index of 18.5–25 and the gestational age of 18–20 weeks to investigate the effect of Olive oil on the prevention and progress of pregnancy striae for 8 weeks, it was indicated that olive oil has no effect on reducing the incidence and severity of pregnancy striae. This study has only investigated the formation of striae during the pregnancy, in such a manner that according to the number of striae in each abdominal area, striae formation severity has been determined. However, our study evaluated other variables such as itching, striae diameter, and striae erythema and redness that the mentioned results were obtained.

Another study, conducted in 2012 again by Ta'avoni et al. on 105 nulliparous women with the gestational age of 18–20 weeks to assess the effect of Olive oil and Teak cream on pregnancy striae in the second trimester for about 8 weeks of pregnancy, showed that using teak cream can effectively reduce the incidence of pregnancy striae. In this study, as in previous one, striae were examined only in terms of number at the baseline and eight weeks after application of the cream. However, in our trial, in addition to the number, the mentioned variables were examined monthly for a period of 5 months. The results of our study showed that *Aloe vera* and sweet almond oil groups, in terms of reducing the erythema and itching of striae, were significantly different from the base cream and control groups. Also, it was observed that both *Aloe vera* and almond oil can prevent the development of abdominal striae. The group C who received base cream and group D as control group who receive no medication are two strengths point of our double-blind study. Furthermore, we examined patient in five steps after start of study for 5 month (until delivery). Our long follow up is another strength point for our study. Small sample size and improper use of the creams can be the limitation of our study.

Conclusions

Aloe vera and sweet almond oil creams reduce the itching of striae and prevent their progression.

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Disclosure statement

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